# CHAPTER D15

## SUBMARINE HAZARDOUS MATERIAL CONTROL AND MANAGEMENT STANDARDS

### D1501. DISCUSSION

a. Submarine hazardous material control and management (HMC&M) standards address the storage, use, and disposal of all hazardous material (HM). In addition, these standards also provide more stringent control and management guidance for HM since they may be atmosphere contaminants. The breathing of fumes, vapors, or gases from these materials may severely impact the health and safety of submariners and submarine equipment.

b. This chapter provides the detailed guidance that submariners need to properly manage and control HM. It supplements the information contained in Chapter B3, specifically addressing submarine HMC&M processes.

c. Special precautions are required for the stowage, handling, and use of HM aboard submarines. Significant hazards include fire, poisoning by breathing toxic substances in unventilated spaces, dermatitis, asphyxiation, and burns of the skin and eyes. Some materials normally thought to be safe may become hazardous under certain use or storage conditions. This chapter contains general stowage and use standards for all HM, precautions for subcategories of HM (flammable materials, toxic materials, corrosive materials, oxidizers, aerosol containers, and compressed gases) and specific precautions for certain selected materials. Chapter B3 provides information on HM spill response and training.

### D1502. GENERAL HMC&M STANDARDS

a. **HM Allowed Aboard Submarines.** Only HM listed in the Submarine Material Control List (SMCL) CD-ROM is allowed aboard submarines. The SMCL is the authorized use list (AUL) for submarines. Personnel shall consult the SMCL to verify that HM is allowed aboard or to identify any use restrictions associated with the HM. HM not listed in the SMCL is considered **prohibited** and shall not be ordered. If a valid requirement exists for a HM item and the material is not listed in the SMCL, the submarine shall complete a SMCL Feedback Report (SFR) (NAVSUP 1400-10/97) and submit it to NAVICP Code 0541 with a copy to the appropriate type commander and procurement department per reference D15-1. NAVICP shall coordinate with Naval Sea Systems Command (NAVSEASYSCOM) and the Submarine Material Review Board (SMRB) to respond to the SFR.

Each SMCL item is marked with a HM use category. NAVSEASYSCOM assigns these use categories based on a technical and safety and health assessment of the product. These use categories are:

(1) **Permitted (N)**. No restriction on use of this HM on submarines.

(2) **Prohibited (X)**. HM not allowed aboard submarines at any time.

(3) **Restricted (R)**. HM not allowed aboard submarines while underway, except under specific exemptions authorized by the submarine's executive of-

ficer. Restricted material may be used onboard in limited quantities ***while in port and ventilating outboard***.

(4) **Limited (L)**. HM that may be used underway for a specific purpose and for which no non-toxic substitute exists. This HM shall not be carried aboard submarines in excess of required quantities.

b. **HM Requisition**. Personnel requiring HM shall only obtain this material through the submarine's supply department. Supply department personnel shall ensure that requisition material is in the SMCL CD-ROM. If the requisitioned HM is assigned a restricted use on the SMCL, written permission from the executive officer will be required to carry or use the material onboard during an underway period.

**NOTE:**

SERVMART purchases of HM shall specifically list the HM to be purchased. All HM purchased through a SERVMART shall be provided to the supply department for recording in the Submarine Material Control Log prior to storage.

c. **HM Open Purchase**. Navy policy is that, to the maximum extent feasible, submarines shall only procure and use standard stock HM.

(1) In the exceptional case for which the stock-numbered product can be clearly demonstrated to be inferior, or due to the urgency of need cannot be satisfied from supply system stock, commanding officers may justify and authorize open market purchases of HM for those items. The submarine shall obtain an MSDS from the manufacturer or supplier and include with a SFR submitted to NAVICP Code 0541, with copies to the appropriate type commander and procurement department.

(2) If submarines or support commands are approached by commercial vendors offering HM not listed in the SMCL for submarine use or for substitution for stock-numbered HM, they shall refer vendors to NAVSEA 03L23, per reference D15-1.

d. **HM Receipt**. The supply department will receive all HM brought aboard the submarine. The supply department shall check all containers of HM obtained through open purchase upon receipt to ensure that they contain a manufacturer's label as described in paragraph D1502e. They shall refuse a container if not so marked. Upon receipt, the receiving person shall check the received material against the SMCL CD-ROM by stock number, manufacturer, and nomenclature to ensure that the material is allowed and determine if any HM use category other than allowed is assigned.

(1) If the material is permitted (N), the receiving person shall enter the material into the Submarine Material Control Log. This entry may be made through the use of form similar to that provided in appendix D15-A.

(2) If the material is assigned a limited use category, the receiving person shall enter the material into the Submarine Material Control Log and make out an Atmosphere Contaminant Tag, (a sample format for the tag is pro-

vided in appendix D15-B). The supply officer/HM coordinator shall sign the Atmosphere Control Tag. The supply officer/HM coordinator shall review the Submarine Material Control Log entry.

(3) If the material is assigned a restricted use category, the receiving person shall enter the material into the Submarine Material Control Log and make out an Atmosphere Contaminant Tag. The supply officer/HM coordinator shall sign the Atmosphere Contaminant Tag. The executive officer shall review the Submarine Material Control Log entry.

e. **Container Marking**

(1) Manufacturer's labels for shipboard identification of HM containers must clearly identify the material name, the manufacturer's name and address, and the nature of the hazard presented by the HM including the organ potentially affected by the material. A manufacturer's label may be a tag, sign, placard, or gummed sticker. When HM is dispensed from the shipping container to another container, the person dispensing the HM shall annotate the receiving container to indicate the material name, manufacturer name and address, and the nature of the hazard (including target organ) as specified by the manufacturer to preserve the continuity of information. To mark unlabeled containers or containers where the label has been destroyed or damaged, ships may use the Department of Defense (DOD) Hazardous Chemical Warning Label. The Hazardous Material Information System (HMIS) (reference D15-2) provides this label and label information at the end of each MSDS. Personnel can print the label on plain paper or the pre-printed color forms: DD 2521 (12/88) (8.5"x11") (S/N 0102-LF-012-0800) or DD 2522 (12/88) (4"x7") (S/N 0102-LF-012-1100).

**NOTE:**

If the material is transferred into a small container, such as a dropper bottle for boiler water chemistry, and there is insufficient room to place the above information on the label, the label shall contain the material name, manufacture's name, and stock number at a minimum. The remaining information shall be provided on a card in a location known to the users, that is in close proximity to the container, so that it can be readily referred to. In addition, supplemental label information shall be keyed, using numbers or letters, to the smaller containers.

(2) Submarine supply departments shall label HM items that are restricted or limited with an Atmosphere Contaminant Tag (see appendix D15-B) per paragraph D1502d prior to issue. They will assign these tags a sequential number preceded by a letter (R or L) to indicate restricted or limited. If a restricted or limited HM is transferred to another container for use, the new container shall also be labeled with the Atmosphere Contaminant Tag. The department transferring the material to the new container shall obtain the tag (and number) from the supply department.

f. **HM Issue**. The supply department retains only limited quantities of HM as storeroom items. The remainder is distributed to responsible workcenters

as operating space items. The receiving workcenter is responsible for proper stowage of HM in assigned lockers.

g. **HM Reutilization.** Submarines shall practice HM reutilization. This means that submarines will implement efforts to ensure that personnel make all beneficial uses of HM prior to offload as used/excess HM. This requires that material with the earliest expiring shelf-life limitations is used first. In instances in which a HM is used by more than one workcenter, submarines may choose to institute procedures whereby one workcenter is responsible for ordering and storing the HM. This action also includes increasing the useful life of the material by extending the shelf life per approved procedures outlined in references D15-3 and D15-4.

h. **Used/Excess HM Disposal.** When workcenters have completely used a HM or have excess HM, they shall return the container plus any residue to the supply department for disposal. Appendix L of reference D15-5 and Maintenance Requirement Cards (MRCs), as applicable, provide guidance for determining which types of used HM must be collected and held for treatment by shore disposal facilities. The receiving person shall annotate in the Submarine Material Control Log and process the used HM for offload per the procedures of section D1502h(4).

(1) Used HM shall be **segregated**. A container shall normally be filled with one type of HM, i.e., all the used HM in a container shall normally be of only one stock number. Used HM shall either be placed in the container for the original material or in an impervious container specified in appendix D15-D. The container shall be securely sealed using the installed or provided closure devices to ensure the container does not leak during transportation. The container shall be properly labeled (refer to paragraph D1502h(4)(a) for labeling requirements) to indicate content, and stowed in appropriate locations following the stowage precautions in this chapter for comparable HM.

(2) If the contents of an HM container are unknown, the label must state so, and the fleet must pay, from its own account, the costs of chemical analysis to determine specific content. The workcenter originating the HM for offload shall provide any information that may be useful in identifying the origin or composition of the material in the container. If the contents are unknown and the originating workcenter can determine by experience that the material is flammable or combustible, reactive, toxic, or corrosive, that information shall be supplied on the container to allow proper stowage aboard ship and at the receiving shore activity.

(3) Used lube oils shall be collected, stored, and labeled for eventual shore recycling. Synthetic lube oils and hydraulic oils shall be collected separately from other oils.

(4) **Procedures for Off-Loading Used or Excess HM to a Naval Shore Activity**. The supply officer shall be responsible for the receipt and consolidation (as appropriate) of all used/excess HM for offload. Used or excess HM shall be turned over to the shore facility HM offload activity per the requirements of reference D15-5.

(a) **Processing Used HM**

1. The workcenter generating used HM shall ensure that it is properly packaged in the original container or in a container specified for the material in appendix D15-C. If there is any question regarding the integrity of the original container (e.g., badly rusted, badly dented, or poorly sealed), the contents shall be transferred to a new container. If the material is not in its original container, the workcenter shall ensure that the material is labeled per paragraph D1502e. In addition, a label identifying the material as used HM (see appendix D15-D) shall be completed and attached to the container. This label shall contain information on the process in which the material was used (e.g., used air compressor lube oil, circuit board cleaning solvent, spent OBA canisters, etc.). It should also identify any known impurities that the material might contain based on routine analysis that may be conducted for PMS (e.g., Naval Oil Analysis Program (NOAP) test results) and any special storage requirements. This information is necessary to assist the shore activity in properly storing the used HM as well as in filling out disposal documentation if the material is processed as waste.

2. The supply department shall ensure that a DD 1348-1 is prepared for each container of used HM. The following information shall be clearly identified (where known) on the DD 1348-1: the NSN, the material name, and the manufacturer's name and address. The individual filling out the DD 1348-1 shall ensure that the container is properly labeled with information required by paragraph D1502e and with the Used Hazardous Material label specified above.

(b) **Transferring Used HM Ashore**

1. The submarine’s supply officer/HM coordinator shall contact the shore activity point of contact to request a pick-up. For used HM which can be identified by a stock number and manufacturer and for which a MSDS is available in the SMCL, the submarine need not provide an MSDS to the receiving activity (one will probably be required if transferring to a non-Navy activity or overseas). Used HM for which a MSDS does not exist in the SMCL or which has been open-purchased shall be accompanied by a hard copy of the MSDS. In situations where compatible materials are inadvertently mixed, the used HM shall be accompanied by the MSDSs of each material in the mixture. If the contents are unknown, the submarine need not include a MSDS, but shall supply information, such as whether the material is flammable, reactive, toxic, or corrosive, in the "Special Stowage Requirements" item of the Used HM label to allow proper stowage at the receiving shore activity.

2. Shore activities shall only require that ships provide used HM that is properly packaged in the original container or in a container specified for the material in appendix D15-C, properly secured, properly labeled, with a properly filled out DD 1348-1, and with a MSDS, if the material originated outside the supply system or a MSDS is unavailable in the SMCL. Material that is non-compliant shall be returned to the originating submarine. Problems experienced with material received from a submarine shall be reported to the command and, if flagrant or repeated, to the submarine’s immediate su-

perior in command (ISIC). If any additional requirements (e.g., waste profile sheets) are placed on the shore activity by Federal or State laws and regulations or by the supporting Defense Reutilization and Marketing Office (DRMO), the receiving shore activity shall ensure that these requirements are met using information supplied by the submarine on the DD 1348-1 and container label. When required, analysis of unknown material shall be charged to fleet accounts.

(c) **Excess HM**. A workcenter shall turn in full, properly sealed containers of usable HM in excess of its needs to the supply department. Supply department personnel shall determine if this material may be used elsewhere in the submarine or if it exceeds the submarine's needs. If the material exceeds the submarine's needs, supply department personnel shall transfer it to the supporting FISC with a properly completed DD 1348-1 for each S/N of material being transferred.

## D1503. GENERAL STORAGE STANDARDS

Submarines shall observe the following general standards to minimize hazards inherent in the handling and storage of HM:

a. Mark stowage locations (including lockers) to identify type of HM stored and keep the location/materials clean and dry at all times. Submarines shall post HM stowage locations with a CAUTION sign that states:

**HAZARDOUS MATERIAL STORAGE AREA**

Submarines should obtain these signs through the Navy supply system using National Stock Number (S/N) 9905-01-342-4851 (10" X 7") or 9905-01-342-4859 (3" X 5").

b. Provide ventilation in HM stowage areas, where appropriate. Ventilation of tanks shall be continued until the gas free engineer certifies they are safe for reentry.

c. Allow only authorized personnel access to stowage locations, where appropriate.

d. When transferring material from one container to another, ensure that existing precautionary labeling is retained and that subsequent containers are marked with appropriate precautionary labeling. DD Form 2521 or DD 2522 may be used for labeling of containers into which HM is transferred. Subsequent containers should also contain proper Atmosphere Contaminant Tags.

e. Do not transfer material to a container that has previously stored a different material without first checking the materials' compatibility.

f. Stow HM only in a container which is compatible to the material (e.g., do not place corrosive materials in metal drums).

g. Stack containers in such a way that they will not crush lower containers, become imbalanced, or be difficult to access.

h. Use material on a first-in, first-out basis, considering shelf life.

i. Prohibit smoking, eating, or drinking in stowage areas. Signs shall be posted indicating these requirements.

j. Ensure that open flames or spark producing items are not permitted in stowage areas.

k. When not in use, seal and protect all containers against physical damage and secure for heavy seas.

l. Maintain explosion proof electrical fixtures in proper condition in appropriate HM stowage areas.

**D1504. GENERAL HANDLING AND USE STANDARDS**

The *Hazardous Material User's Guide* (reference D15-6) provides information on the handling and use of 22 HM groups. This guide should be consulted for precautions on handling and use of HM within these groups. Observe the following general standards when handling HM:

a. Workcenter supervisors shall ensure that, prior to using any HM, personnel under their supervision are trained on the hazards associated with that material and that they have been provided with necessary protective clothing and equipment (i.e., eye protection, respiratory devices, and gloves impermeable to the HM in use).

b. Workcenter supervisors shall ensure that spaces are well-ventilated in areas where HM is used.

c. Upon completion of HM use, return surplus material to its appropriate storage location.

d. Avoid breathing vapors or dust when using HM.

e. Avoid contact with the eyes or prolonged contact with skin when using HM.

f. Prohibit smoking, drinking, or eating in areas where open containers of HM is being used.

g. Ensure personal protective equipment (eye protection, respiratory devices, gloves impermeable to the HM in use, etc.) is in good operating condition and is readily available to all personnel working with HM.

h. Before entering spaces that have been closed for significant periods of time, have the ship's MDR determine that atmosphere is safe for entry for ship's force personnel only. For all other Navy personnel, other than the ship's force, a qualified Gas Free Engineer is required to determine if the space is safe for entry.

i. Use a respirator with appropriate filter when potentially exposed to particulate matter, hazardous gases, or vapors. Consult the MDR for specific

guidance in this regard, and for a determination of the need for more stringent respiratory protection requirements.

j. Do not add incompatible materials to the same collection container.

## D1505. FLAMMABLE AND COMBUSTIBLE MATERIAL

A flammable material is any solid, liquid, vapor, or gas that will ignite easily and burn rapidly with a flash point less than 1500°F. The Department of Transportation (DOT) and the National Fire Protection Association (NFPA) define flammable liquid as a liquid with a flash point below 141°F. Liquids that have a flash point greater than 141°F but less than 200°F are defined by DOT and NFPA as combustible liquids. The NFPA defines non-liquid materials such as paper, wood, and rags as ordinary combustibles. Although all flammable and combustible liquids present some danger to personnel and the ship, of prime concern are those liquids having flash points less than 200°F. Never carry flammable or combustible liquids aboard ship in quantities in excess of that required; always stow flammable and combustible liquids in approved locations; and never use flammable or combustible liquids near a heat source or spark-producing device.

a. **Storage Standards**

(1) Store flammable and combustible materials following precautions listed in paragraph D1503.

(2) Store flammable and combustible materials separately from oxidizing materials (i.e., sodium nitrate, calcium hypochlorite, potassium permanganate, peroxides, and strong inorganic acids (nitric, hydrochloric, and sulfuric acids)), (see appendix D15-E: Hazardous Material Compatibility Storage Diagram).

(3) Store a maximum quantity of 12 gallons of any one type of material with a flash point greater than 200°F, but less than 1500°F (excluding grease), in an area designated by the engineer officer. The containers shall not be stowed within 3 feet of any surface where the temperature may exceed 140°F. More than 12 gallons of grease may be stowed in one location (in original containers and greater than 3 feet from 140°F surfaces).

(4) Submarines not having flammable/combustible liquid lockers shall store all items with a flashpoint less than 200°F, solids and semi-solids which give off flammable vapors, solids which burn with extreme rapidity because of self contained oxygen, and materials which ignite spontaneously when exposed to air in a manner that minimizes fire hazards until such time as flammable/combustible liquid lockers available.

(5) Do not stow combustible materials such as rags, paper and wood in the same area as flammable materials; however, submarines may stow oily rags in these areas after placing in suitable containers.

(6) Prohibit open flames or spark-producing items in the vicinity of flammable stowage locations.

(7) Ensure containers are secured with metal banding or other approved tie-downs vice manila line.

b. **Handling and Usage Standards**

(1) Handle and use flammable materials per the precautions of paragraph D1504. Many flammable and combustible materials have additional hazardous properties, such as toxicity. See also Section D1506.

(2) Never use flammable material near a heat source or a spark-producing device. Do not smoke in an area in which flammable material is being used. Designate spaces in which flammable materials are being used as **NO SMOKING** areas.

(3) Keep scrapings and cleaning rags soaked with flammable or combustible liquids in a covered metal container until the HM is disposed of properly.

(4) Keep suitable fire extinguishing equipment and materials ready at all times for instant use.

(5) Ensure that containers of partially used flammable materials are returned to proper stowage facilities, are tightly closed, and are properly labeled.

## D1506. TOXIC MATERIAL

A toxic substance has the inherent capacity to produce personal injury or death through ingestion, inhalation, or absorption through any body surface. Toxic materials are considered, and often marked by the manufacturer as being, poisonous. Avoid contact with toxic materials by using suitable protective clothing and following safe handling procedures. Submarines must, to achieve their missions, carry some toxic material, and personnel will be called upon at times to use them. Solvents, degreasers, and refrigerants are but a few of the toxic materials that may be found aboard submarine. If stowed, handled, and used in the proper manner, toxic materials present little or no danger.

a. **Storage Standards**

(1) Store all toxic material per the standards of paragraph D1503. Many toxic materials have additional hazardous properties, such as flammability or combustibility. See also section D1505.

(2) Store all toxic material in cool, dry, well ventilated locations separated from all sources of ignition, acids and acid mists/vapors, caustics, and oxidizers, (see appendix D15-E: Hazardous Material Compatibility Storage Diagram).

(3) Seal all containers and protect them against physical damage.

b. **Handling and Usage Standards**

(1) Handle and use toxic materials per the precautions listed in paragraph D1504.

(2) Use appropriate gloves and protective clothing when handling sensitizers or potential skin irritants such as epoxy and polyester resins and hardeners where significant skin contact is likely. Protective skin cream shall only be used to supplement, but not replace impermeable gloves for any operation where significant contact work with potentially toxic/irritant/sensitizing materials is likely.

c. **Halocarbons (Refrigerants)**. Liquid or gaseous halocarbons have multiple applications in the Navy. They are used as refrigerants, solvents, and dielectric fluids and as line flushing, and degreasing agents. With common names of refrigerant R-11, R-12, R-22, R-113, R-114, and R-116, these products may be better known by names such as FREON , ISOTRON , FRIGEN , FLUORANE , FREON MF , FREON TF , GENSOLV D , BLACO-TRON TF , and ARKLONE P-113 .

**NOTE:**

Due to changes in the Clean Air Act, the use of halocarbons is being phased out; however, they are still used in the Navy.

(1) To minimize the size of spills, procure, store, and use halocarbons in the smallest amount and container possible for an operation.

(2) The Naval Supply System stocks all normally used halocarbons, and submarines should procure them only through that system.

(3) Prohibit smoking and hot work in areas or vicinity where halocarbons are being used.

(4) Prohibit storage and consumption of food and tobacco in areas where halocarbons are being used.

(5) Some types of FREON are nearly odorless and can numb the sense of smell.

(6) Only use FREON-113 as a solvent when specified and when such use is essential. It may not be stored or carried aboard (see 1,1,1-trichloroethane below).

d. **Toxic Cleaning Solvents**. Toxic cleaning solvents such as 1,1,1-Trichloroethane shall not be stored or carried aboard. Submarines shall not attempt solvent cleaning except alongside a pier or tender. Submarines shall not use solvent cleaning until mechanical cleaning has failed or is technically impossible (for example, FREON flushing of $O_2$ piping). Use only prescribed cleaning solvents with a flashpoint greater than $140^{o}F$ . Do not spray diesel fuel or other solvents as a cleaning agent. When cleaning solvents are used, use explosion-proof mechanical exhaust ventilation to exhaust vapors overboard to prevent reentry and recirculation. The ventilation rate (cubic feet per minute) and any other control measures will be determined by the cognizant tender industrial hygienist (safety officer) or the supporting shore activity's shore maritime gas free engineer.

e. **Polychlorinated Biphenyls**

(1) In general, PCBs, if properly managed, do not present a major health hazard. The Environmental Protection Agency banned PCBs in most manufacturing processes in 1979. However, PCBs may be found as a fire retardant in many materials used in ship construction where stocks of PCB material purchased prior to the ban were consumed. Some examples of materials used in submarine construction that may contain PCBs include: sound dampening on reduction gears; electrical cable insulation; foam hull insulation; rubber (used as banding and sheet rubber for cableways, pipe hanger liners, isolation mount, and vent gaskets); packing and grommets for electrical cable stuffing boxes; and pipe insulation and lagging.

**NOTE:**

PCB-containing construction materials installed in Navy submarines need not be removed just because they contains PCBs. Installed PCB-containing construction materials normally need not be labeled.

(2) Label PCB-containing electrical/electronic components (primarily capacitors) per the guidance provided in reference D15-7. Label PCB-contaminated tools and waste materials (such as dust from ventilation ducting which are known to contain PCB-impregnated felt gaskets) per Appendix D15-F.

(3) With the exception of ventilation duct cleaning, work involving known or potential PCB-containing materials shall normally be accomplished in port. Obtain assistance through the nearest naval shipyard environmental program office, Navy medical treatment facility, or NAVENPVNTMEDU prior to such action.

(4) For situations not involving unprotected PCB skin contact, employ routine work and personal hygiene measures (such as washing hands and other exposed skin surfaces with soap and water when work is completed) appropriate for any occupational setting.

(a) When working with PCB-impregnated materials such as insulating felts or with articles that contain liquid PCB solutions, strictly observe good housekeeping procedures to avoid the possibility of secondary surface contamination.

(b) Personnel involved in PCB-related work activities shall not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the space in which work is being performed.

(c) Collect and dispose of PCB-containing waste, scrap, and debris; dust collected from ventilation systems known or suspected of containing PCB-impregnated felt gaskets; and PCB-contaminated clothing (consigned for disposal) in sealed impermeable containers specified in appendix D15-C and labeled with the large label described in appendix D15-F. Disposal should be per the procedures of section D1502e. Specifically notify the receiving activity that PCBs or material containing PCBs is being transferred.

(d) Do not perform hot work in the immediate area when work is performed with PCBs or PCB-containing material. Do not perform hot work, including welding, torch cutting, brazing, grinding, and sawing on ventilation systems components within 12 inches of either side of a flange containing felt gaskets.

(e) Specific work practices for the removal and handling of PCB felt, maintenance and cleaning of ventilation ducting containing PCB felt, and maintenance and handling of other shipboard PCB materials are provided in reference D15-7.

(f) Label all reusable cleaning equipment employed in cleaning systems potentially contaminated with PCBs with PCB labels described in appendix D15-F. Use the large label whenever practicable. If the large label does not fit, use the small label. Equipment to be labeled includes vacuum cleaner, vacuum hoses and working end tools, brushes, Vent Duct Cleaning System components, dust pans, scrapers, and putty knives. Label; bag, where possible; and stow this equipment in a location where it will not be accidentally used for other purposes.

(5) The baseline industrial hygiene survey shall specify personal protective equipment and medical surveillance for any potential PCB-related work.

## D1507. CORROSIVE MATERIALS

Corrosive materials are chemicals, such as acids, alkalis, or other liquids or solids which, when in contact with living tissue, will cause severe damage to such tissue by chemical action. In case of leakage, corrosive material will materially damage surfaces or cause fire when in contact with organic matter or with certain chemicals.

### a. Storage Standards

(1) Store all corrosive materials per the precautions listed in paragraph D1503.

(2) Store corrosive materials in their original containers.

(3) Ensure that corrosive materials are not stored in the vicinity of oxidizers or other incompatible materials, (see appendix D15-E: Hazardous Material Compatibility Storage Diagram).

(4) Ensure that acids and alkalis are stowed separate from each other.

### b. Handling and Usage Standards

(1) Handle and use corrosive materials per the precautions listed in paragraph D1504.

(2) Wear chemical goggles and full face shields, rubber gloves, rubber boots, and aprons when handling acids or other corrosive materials.

(3) Never allow corrosive materials or their vapors to come in contact with the skin or eyes.

c. **Inorganic Acids**

(1) Stow liquid inorganic acids such as hydrochloric, sulfuric, nitric and phosphoric acids bottled in glass or plastic in such a manner that they are cushioned against shock. They should be kept in their original shipping carton or box inside suitable acid-resistant lockers, cabinets, or chests.

(2) Maintain hydrofluoric acid in acid-proof polyethylene or ceresin-lined bottles at all times and never allow them to come in contact with skin or eyes.

(3) Do not stow inorganic acids in the vicinity of flammable liquids.

d. **Organic Acids**. Do not permit liquid and solid organic acids such as glacial acetic, oxalic, carbolic, cresylic, and picric acids to come in contact with the eyes or skin. These acids are corrosive to aluminum and its alloys, to zinc, and to lead. Keep these acids, usually packaged in glass bottles, from freezing and physical damage. Stow these acids in an approved acid locker lined with acid-resistant material, separated by at least 3 feet from all other material. Lockers shall be separated by a partition, or by at least 3 feet from all other material.

e. **Alkalis**. Stow alkalis (bases), such as lithium hydroxide, sodium hydroxide, potassium hydroxide (lye), disodium phosphate, trisodium phosphate, sodium carbonate, and ammonium hydroxide (ammonia water) in designated lockers, cabinets, or chests. Keep alkalis separated from acids, oxidizers, and other incompatible materials. Ensure the stowage area is dry.

**NOTE:**

Many submarine cleaning agents and laundry materials contain alkalis in very strong concentrations. Specified stowage and handling precautions for these materials must be observed.

## D1508. OXIDIZERS

An oxidizer is a material such as chlorate, perchlorate, permanganate, peroxide, or nitrate which yields oxygen readily to support the combustion of organic matter, or which may produce heat or react explosively when it comes in contact with many other materials. Higher temperatures increase the possibility of oxygen release from oxidizers and the possible initiation of fire. Heat shall be avoided when handling and storing oxidizers. Oxygen candles are oxidizers.

a. **Storage Standards**

(1) Store oxidizers following precautions listed in paragraph D1503.

(2) Do not store oxidizers in an area adjacent to a torpedo room or small arms ammunition storage or heat source or where the maximum temperature exceeds 100°F under normal operating conditions.

(3) Ensure that oxidizers are not stored in the same compartment with easily oxidizable material such as fuels, oils, grease, paints, or cellulose products. Do not remove or obliterate labels.

b. **Handling and Usage Standards**

(1) Handle and use oxidizers per precautions listed in paragraph D1504.

(2) When transferring oxidizers to second containers, **ensure that the second container is compatible with oxidizing material**. Place appropriate hazardous material labels on the second container.

(3) Do not remove or obliterate warning labels from containers.

(4) Ensure oxidizing materials are only handled or used by authorized personnel.

c. **Calcium hypochlorite** is a chemical substance used to provide the sanitizing and bleaching property of chlorine without requiring the handling of liquid or gaseous chlorine.

(1) The following standards apply to the stowage of calcium hypochlorite:

(a) The ready usage stock of 6-ounce bottles issued to the Medical and Engineering Departments shall be stowed in a Medical Instrument and Supply Set Case, S/N 6545-00-131-6992, which shall be kept in a secured locker with ventilation holes, preferably located in the cognizant department office space. Under no circumstances shall the stock of calcium hypochlorite bottles be stowed in a machinery or nuclear space, berthing space, storeroom, or in the nucleonics laboratory areas.

(b) Label all lockers, bins, and enclosures with red letters on a white background:

**HAZARDOUS MATERIAL, CALCIUM HYPOCHLORITE**

(c) Dispose of containers as used/excess HM and replace when they exceed 2 years from the date of manufacture.

(2) The following precautions apply when using calcium hypochlorite:

(a) Mix only with water.

(b) Do not allow to come into contact with paints, oils, greases, wetting agents, detergents, acids, antifreeze, alkalis, or organic and combustible materials.

(c) Do not remove or obliterate warning labels.

(d) Dispense only in clean, dry utensils and only in amounts required for immediate use.

(e) Avoid contact with skin and eyes.

(f) Ensure containers are not used for any other purpose.

(g) For external contact or if taken internally, follow the instructions printed on the container label or on the material safety data sheet (MSDS).

(h) No special firefighting precautions are required for fires caused by calcium hypochlorite.

**D1509. AEROSOLS**

Aerosol spray cans are prohibited aboard submarines except as specifically allowed by the SMCL.

**D1510. COMPRESSED GASES**

Submarines carry numerous cylinders of compressed gases. Compressed gases are used for welding operations (oxygen and acetylene), in refrigeration and air conditioning systems (FREON ), and for purging various systems (nitrogen). Cylinders of compressed gases are potential explosion, fire, and health hazards if do not strictly comply with existing requirements.

a. **Storage Requirements**

(1) General

(a) Only stow compressed gases in compartments and locations designated for cylinder storage, as shown in applicable plans for each submarine. Whenever practical, stowage shall permit removal of any cylinder without disturbing other cylinders. Such locations shall:

1. Be kept free of flammable materials (especially greases and oils).

2. Be maintained at temperatures below 130 degrees Fahrenheit.

(b) Ensure that cylinder valve protection caps are in place.

(c) Stow cylinders by date of receipt, and place into service in the order of receipt.

(d) Tag empty cylinders **EMPTY**, mark **MT**, and segregate from full or partially full cylinders.

(2) Ready Service

(a) The following gas cylinders are found aboard submarines:

1. Fire extinguishers (portable).

2. Fire-extinguishing cylinders permanently connected to fixed fire-extinguishing systems.

3. Gas and chemical canisters for oxygen breathing apparatus.

4. Welding cylinders.

5. Medical gas cylinders.

6. Cylinders containing refrigerants.

7. Disposable cylinders supplied as repair kit accessories (halide leak detector kits, for example).

8. Gas cylinders for the propulsion plant operations.

9. Diving air (SCUBA) tanks.

(b) Welding Cylinders. Observe the following special instructions and precautions regarding oxygen and fuel gas cylinders in ready service:

1. Install cylinders of gas per approved plans or specifications.

2. Fasten cylinders securely in a rack. Ensure acetylene cylinders are always stowed vertically. Securely fasten the rack, in turn, at the designated locations.

3. Never leave unstowed equipment unattended.

4. Return welding units to designated stowage as soon as work is complete.

5. Attach a card to each welding unit with the following instructions:

> Return to (designated location) immediately on completion of work.
> Unit shall not be left unattended while away from above location.
> Unit is **NOT SECURE** while pressure shows on gauges, or cylinders are not firmly fastened to rack and properly stowed.

b. **Handling and Usage Requirements**

(1) Never drop cylinders nor permit them to strike against one another violently.

(2) Never use a lifting magnet or a sling (line or chain) when handling cylinders. If a crane or hoist is used, provide a safe cradle or platform to hold cylinders. Do not lift cylinders by valve protection caps.

(3) When returning empty cylinders, be sure that valves are closed and that valve outlet, if provided, and cylinder valve protection caps are in place.

(4) Ensure that all cylinders are approved under DOT regulations. Non-magnetic cylinders are an exception.

(5) Only refill cylinders when the command specifically approves such action.

(6) Fill a cylinder only with the gas for which the cylinder has been specifically designated.

(7) Do not remove or change the numbers or marks stamped into cylinders without the specific approval of the Defense General Supply Center.

(8) Never use cylinders for rollers, supports, or for any purpose other than to carry gas.

(9) Never tamper with the safety devices on valves or cylinders.

(10) Never hammer or strike the valve wheel in attempting to open or close valves. Use only wrenches or tools provided and approved for this purpose. If valve cannot be turned using hand or proper tool, return the cylinder to supply activity.

(11) Be sure that the threads of regulators or other auxiliary equipment are the same as those on cylinder valve outlets. Never force connections that do not fit.

(12) Do not use regulators, pressure gauges, manifolds, and related equipment that are provided for a particular gas on cylinders containing different gases.

(13) Only repair or alter cylinders or valves when authorized by NAVSEASYSCOM. If trouble is experienced, remove cylinder from service, tag as defective, and return to supply activity. Do not remove the stem from a diaphragm-type cylinder valve.

(14) Never subject compressed gas cylinders, either in stowage or in service, to a temperature in excess of 130$^{o}$F. Never permit a direct flame to come in contact with any part of a compressed gas cylinder.

(15) Handle cylinders carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve, or safety devices and may cause leakage. Protect cylinders from objects that will cut or otherwise abrade the surface of the metal.

(16) When testing for leaking gas cylinders, use soapy water or leak-detection compound conforming to MIL-L-25567.

(17) Only use a gas cylinder that is properly marked (by color of paints or with the name of the gas stenciled on cylinder and valve). Return all mis-marked cylinders to the nearest Naval Supply Depot.

(18) Work center supervisors shall ensure that supply and exhaust ventilation exists in compartments where compressed gases are stored or in use, systems are in good operating condition, and have been evaluated as adequate by an industrial hygiene survey team.

(19) To thaw out valve outlets that are clogged with ice, use warm (not boiling) water. The use of boiling water will melt the fusible plugs, if present, and vent the cylinders.

(20) Never discharge a cylinder into any device or equipment in which the gas will be entrapped and create pressure. The only exception is a cylinder equipped with a pressure regulator set to control the pressure.

(21) Never use oil-tolerant gases when oil-free gases are required. Non-interchangeable valve outlets discourage this practice.

(22) Close the cylinder valve and release the gas from the regulator before removing the regulator from a cylinder valve.

c. **Recharging Cylinders Aboard Ships**

(1) Recharge only diving air (SCUBA) cylinders: The charging of divers' scuba tanks from the ship's air system shall meet the purity requirements of paragraph 5.2.1.2 of reference 15-8. Commanding Officers may omit this requirement during emergency situations.

(2) Personnel may refill small cylinders of hydrogen routinely used for nuclear propulsion plant operations per the Reactor Plant Manual.

(3) Personnel may recharge fire extinguishers and fire extinguishing system cylinders per NSTM 555.

(4) Recharge a cylinder only if less than 5 years have passed since its last hydrostatic test date. The only exceptions are 3A and 3AA cylinders having water capacities under 125 pounds, for which a 10-year hydrostatic test frequency is approved. For fire extinguisher and fire extinguishing system cylinder hydrostatic test requirements, see NSTM 555.

(5) Never attempt to mix gases in a cylinder. Unauthorized personnel should never refill a cylinder.

d. **Welding Cylinders**

(1) Place cylinders a safe distance away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them. Use fire-resistant shields.

(2) Do not place cylinders where they might become part of an electric circuit. Avoid contact with energized equipment. Keep cylinders away from

piping systems that may be used for grounding electric circuits, such as for arc welding machines. Any practice, such as the tapping of an electrode against a cylinder to strike an arc, is prohibited.

(3) Unless connected to a manifold, do not use oxygen from a cylinder without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, open the valve slightly for an instant and then close. Always stand to one side of the outlet when opening the cylinder valve.

(4) Always place the fuel-gas cylinders with valve end up. Store and ship liquefied gases with the valve end up. Prior to use, store acetylene cylinders in a vertical position for a minimum of 2 hours to stabilize the gas. If acetone flows from the cylinder, put aside the cylinder for an additional period.

(5) Do not place anything on top of an acetylene cylinder that may damage the safety device or interfere with the quick closing of the valve.

(6) Never use fuel gas from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a regulator attached to the cylinder valve or manifold.

(7) Do not use copper tubing with acetylene gas cylinders due to the increased potential for an explosive chemical reaction.

(8) Back off on the regulation screws, and then open the cylinder valves slowly. Open the acetylene valve one-fourth to one-half turn. This will allow an adequate flow of acetylene, and the valve can be closed quickly in an emergency (never open the acetylene cylinder valve more than one and a half turns). The oxygen cylinder valve should be opened all the way to eliminate leakage around the stem.

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## CHAPTER D15

## REFERENCES

D15-1 NAVSEA S9510-AB-ATM-010/(O), Nuclear Powered Submarine Atmosphere Control Manual (NOTAL)

D15-2 Hazardous Material Information System (HMIS)

D15-3 NAVSUP Publication 4105, List of Items Requiring Special Handling (NOTAL)

D15-4 NAVSUPINST 4410.52B, Shelf-Life Item Identification, Management, and Control (NOTAL)

D15-5 OPNAVINST 5090.1B, Environmental and Natural Resources Program Manual (NOTAL)

D15-6 OPNAV P-45-110-95, Hazardous Material Users Guide (NOTAL)

D15-7 NAVSEA S9593-A1-MAN-010, *Shipboard Management Guide to PCBs* and associated NAVSEA issued PCB Advisories (NOTAL)

D15-8 NAVSEA 0944-LP-001-9010, U.S. Navy Diving Manual (NOTAL)